**COMMISSIONER SIMINGTON ADDRESS TO HUDSON INSTITUTE**

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Thank you very much to Commissioner Furchtgott-Roth and the Hudson Institute for hosting this event, and for the distinguished panelists for joining today. I'll try to keep my remarks brief, but sadly, I will probably fail.

Thomas Kuhn, in *The Structure of Scientific Revolutions*, advances the ideas of normal science and paradigmatic change as explanations for scientific revolution. Normal science, says Kuhn, is where scientists working in a field labor on well-defined problems that are continuous with, and understood by, others in their field of study. There exists, within normal science, consensus around the basic concepts that are the subject of study—the physical, or, in some cases, social mechanisms that drive observed behavior. Scientists do their experimental work in a way that, more-or-less, accords with a theory of the world shared by others in their scientific domain.

But, says Kuhn further, from time to time there comes a revolution in scientific understanding—a fully new model of the world that explains most or all of the same observational phenomena observed by those doing 'normal science', but does so in a way that may not merely slightly misalign with prior understanding, but, indeed, overturn it completely. A new paradigm emerges from the chrysalis of the old, a fully new creature. I choose this metaphor specifically—you see, a caterpillar does not merely grow wings within a chrysalis or some such. A caterpillar within a chrysalis is fully liquid. If you cut a chrysalis open at the right stage, caterpillar soup pours out. A caterpillar digests itself to form a fully new creature, with fully new structures. The same DNA, and the same physical substrate, yields an entirely different insect.

Kuhn's most-cited example of a scientific revolution—one apt for the subject of today's discussion—is the Copernican revolution.

Please excuse me for simplifying, as I'm sure I'll miss some important details, but the Copernican revolution had essentially the following contour. Prior to Copernicus, astronomers believed in the geocentric, or Ptolemaic, model of the heavens. (I understand that there are some disputes as to whether and to what extent this belief was widely held, and indeed it appears evident that relatively sophisticated heliocentric models of our local universe existed

contemporaneously with the Ptolemaic system, but as I am a mere regulator rather than an historian of science, Ptolemy it is.) The Ptolemaic model, to explain the revolution of heavenly bodies around the earth, required epicycles—a smaller, revolutionary transit around a fixed point within the larger wheel of planetary revolution around the earth, much like a planetary gear system does in machinery. In the Ptolemaic system, a planet revolves not around the earth as such, but around a point which itself is revolving around the earth.

Without the epicycle, observed planetary motion was basically inexplicable, because sometimes planets appeared to move backward. The trick is, however, that *with* the epicycle, planetary motion was *largely* explicable. *Mostly* understood. But there were some issues. A few evidential anomalies. And those anomalies began to stack.

What do you do with anomalies? Well, the Ptolemaic system actually was, itself, a refinement of a prior geocentric planetary model attributed to Hipparchus, who had predated Ptolemy by a couple of centuries and, indeed, to whom Ptolemy himself had credited his own initial understanding of planetary motion. The Ptolemaic system, while relying on the same basic conceptual priors, nevertheless posited a few refinements here and there that better explained observational data. The Ptolemaic system was, therefore, evolutionary rather than revolutionary.

But what do you do when you take a scientific model of the world as far as it seems suited to go, and you are left with an unaccountable pile of experimental or observational anomalies? When you can no longer refine your model?

Then comes a revolution—I might here have used a 'step change' in understanding, but that isn't quite right, because you aren't even on the same graph. You're in a fully new domain. And maybe you diagonalize your observational results into this domain, and you find that not just are well-understood results amply accommodated, but the anomalies are too.

Of course, I'm skipping a step. Why do some people break with the past to dream up the new concept, and under what conditions is a new concept dreamt up? Well, if we had a model for *that*, I think we would be living in a very different world. I'll simply offer the probably apocryphal account of how August Kekule came up with his idea for the structure of the benzene molecule—that is, he dreamt of a snake eating its own tail, and when he awoke, realized that benzene had to be a ring, creating the immensely productive ideas of ring-shaped aromatic hydrocarbons and molecular resonance. He quite literally dreamt it up, so take that for whatever

it's worth. But however the revolution comes, it comes. And real progress, once again, becomes possible.

The anomalies have begun to stack, as it were, in telecom regulation. The conceptual priors upon which 'normal regulation' has proceeded have been, from time to time, called into question.

Consider that, when the FCC was formed by the 1934 Communications Act, spectrum was ample and, essentially, free. Interference—at least subsequent to band allocation and licensure initially introduced in 1912 and evolved in 1927 by the Radio Act—was functionally a non-issue. The telephone was a nascent technology; commercial radio had been around for just over a decade; and television, at least as a commercial product, existed not at all. And throughout the subsequent decades, the Commission, and Congress, together refined the application of the act as the conditions on the ground—let's call them the material conditions—began to change. And by 1996, at the dawn of the so-called information age, enough material conditions had changed so as to require an evolutionary step. And so the Telecommunications Act was passed which included, among other things and for the first time, explicit treatment of information services.

Times have changed a bit more rapidly between 1996 and 2023, largely due to the explosion of those same information services, than they did between 1934 and 1996. And, at least from where I sit, the anomalies have, once again, started to stack. It is not clear to me, for instance, that the singular focus on regulation of transmission, rather than reception, in spectrum accommodates everything we need it to. Or that the Commission, once it has confirmed that RF emitting equipment, so long as it operates within the constraints of its factory software and license, should, or must, sit on its hands with regard to the security of that device. Or that the media marketplace is actually an archipelago of different modes of transmission, rather than a single regulatory continent. A Kuhnian might say: something is going to happen.

Whether that 'something' is revolutionary or, what is much more likely, evolutionary, is a matter for Congress; but, indeed, something, at some point soon, has to give. Because, while the Commission has within its remit a few regulatory levers to pull to address some of the material conditions before it, some refinement of the underlying bases for authority—that is to say, the statutory equivalent of our conceptual priors—is probably in order.

And yet, having set the stage of regulatory evolution, I believe the Commission has before it a compelling regulatory opportunity. One for which—at least to my mind—it is well-poised to address with existing authority. One by which it can accelerate the growth of a sector that promises, itself, its own evolution, or even revolution, in commercial and industrial applications. And one in which the Commission can help America secure itself as the world leader of what is among the most exciting areas of technological and economic growth in generations. Our next regulatory evolution, *unlike* the Ptolemaic model, is not geocentric. It is LEOcentric.

*Not* unlike the Commission's other regulatory domains, the conceptual priors informing the Commission's authority have begun to admit of anomalies in the material operating conditions. The Commission's existing satellite authority was born in a different era—an era of sparse, high, long-lived, and heavy satellites launched by state actors to accomplish fundamentally dual-use objectives. And while satellites may have intrinsic dual-use aspects, the complexion of the marketplace has otherwise shifted. The future, and indeed the present, is massive constellations of hundreds, or thousands, of comparatively low-orbiting, short-lived, and small satellites with principally commercial applications. There are tens of thousands of satellites in the Commission's approval pipeline alone, to say nothing of those in other countries. And what once was a tertiary or lower concern regarding orbital debris generated by satellites or launch vehicles has become an urgent, significant consideration for every satellite operator, to say nothing of human space flight. A revolution in orbital debris mitigation, therefore, may in fact be merely a reasonable evolutionary step in addressing the revolution in material conditions of satellite operation.

Here too the anomalies have begun to stack. Starlink alone has engaged in at least 1700 publicly-reported avoidance maneuvers in response to the debris squall generated by a single recent Russian anti-satellite, or ASAT, test. Chinese rocket bodies have hit the moon, and, what is far worse, have fallen, uncontrolled, into international airspace. Some accidents will, no doubt, happen at the birth of any industry despite the best intentions. Optimal safety is not perfect safety. But what we must avoid—and what grows more likely in a massively populated, yet largely unregulated, space environment—is calamity. The new space age is upon us, and to both potentiate transformative economic value and prevent irretrievable loss of human and scientific value, it must occasion a revolution in regulatory thinking.

Having waxed philosophical at some length, let me now speak plainly. America should lead the space economy. Period. We have something like half of the customers of the existing satellite marketplace. We have many of the dominant commercial satellite operators domiciled within the U.S. And while the space economy is international in its very essence for the literally physical reasons of satellite transit, the United States is set up with a regulatory 'hook', as it were, as few other jurisdictions are, and we can use that hook like a debris removal tug to pull the market along to where it needs to go. Let me explain how we can get there in three ways.

First, I strongly encourage Congress to adopt the SAT Streamlining Act. This bipartisan bill requires the Commission to clear its own logjams in the processing of satellite license applications and modifications by setting shot clocks on Commission decisionmaking in all significant aspects of Commission satellite processing activity. It further provides 'fast lanes' for the grant of certain license modifications. It limits the amount of information provided to the Commission by satellite operators to only that which is essential to inform a Commission determination. And it requires the Commission to adopt a thoroughgoing framework for orbital debris mitigation for satellites that is harmonized with a whole-of-government approach, while still leaving the Commission freedom to adopt additional standards that are consistent with existing practices adopted by the Secretary of Commerce (which would, in all likelihood, be NASA's Orbital Debris Mitigation Standard Practices).

The Chairwoman took a bold step in the creation of the Space Bureau, and was right to do it. But for the SAT Streamlining Act to be a success and to catalyze the world space economy through American leadership, it must be paired with a formal, Congressional expansion of Space Bureau resources. The Commission has 1500 employees to oversee something like 1/6$^{th}$ of the American economy. By contrast, the Department of Agriculture has something like 100,000. The Commission needs at least an additional 100 full-time employees, mostly engineers, in the Space Bureau if we are to deliver on the transformative promise the SAT Streamlining Act puts before us. Without greater resources to process the unprecedented number of complex satellite license and market access applications, we risk worsening the *status quo ante*, albeit with greater consternation on the part of operators already racing to the regulatory bottom and flying flags of convenience. To succeed in contending with orbital debris, the Commission first must succeed in processing applications.

Second, the Commission should push toward market access and license equilibration in the mitigation of orbital debris. The situation at the Commission right now is that, while U.S.-licensed operators are subject to direct Commission oversight when it comes to filing their orbital debris mitigation plans, foreign-licensed operators seeking market access may file an orbital debris mitigation plan that is "subject to direct and effective regulatory oversight" by another country's licensing authority and have its plan deemed adequate.

The Commission must state, and the record supports, that *any* satellite operator that points a telecommunications satellite at a U.S. earth station should be subject to exactly the same orbital debris mitigation rules. The Commission simply cannot rely on comity with other jurisdictions with less, or no, skin in the game, nor can or should the Commission independently evaluate the practices of regulatory authorities of other jurisdictions. Instead, the Commission should provide clear regulatory certainty that its rules apply to all operators seeking access to the robust—and, for now, perhaps even indispensable—American satellite consumer market. By this single move, the Commission could provide a very strong incentive for other jurisdictions to harmonize their own regulatory approaches with that of the United States, and place America in pole position on the international stage for future satellite regulatory activity. More than any other single decision in the regulation of orbital debris, this is the Commission's most significant card to play, and it ought to play it.

Third, the Commission should parametrize, and measure, every rule related to orbital debris mitigation, and it should condition future grants to operators on retrospective assessments of their success or failure in meeting orbital debris mitigation benchmarks. Right now, orbital debris mitigation plans have an essentially prospective character. But, with our reform of the post-mission disposal rule, we have, for the first time, formally begun to evaluate operating *record* in the grant of future licenses to operators. This evolution is an unalloyed good. The Commission should move further toward the establishment of operator-neutral parameters for safe space operation; measure, whenever possible, operational success or failure in meeting those parameters; and condition future Commission grants on operating records.

Permit me to anticipate and manage a couple of objections. First: we don't have broad authority over orbital debris. Yes, we do. Perhaps you expected a longer answer. Okay. Y es, we absolutely and very much do. The Commission has asserted its authority over orbital debris for two decades, and, for the most part, we haven't heard boo about it. The Commission asserts

its authority over *far* more contested domains literally all of the time. And yet, for twenty years, crickets have chirped in the long regulatory grasses of orbital debris.

Second: even if the Commission takes the regulatory reins of the commercial satellite market through broad and clear application of its market access authority, the *real* problems for space economy are Russia, China, and, what is perhaps worst, actors who have no present interest in the well-functioning of space, but who have the capacity to deliver a ton or two of particulate debris into orbit.

This objection, though I hear it often, appears to me to have the character of: why are you regulating harmful interference between television stations when there's nothing on that I want to watch? There are some things that the Commission cannot and ought not to address, and geopolitics is the nonpareil exemplar of "not my circus, not my monkeys." While I happily grant that the Commission can do nothing regarding how major state actors behave, I don't believe that it follows that the Commission ought happily to grant market access to any operator who requests it. And of course, orbital debris mitigation capabilities encouraged by our actions would get us farther along in addressing such risks than we would be otherwise.

Third: we should wait on international consensus. A couple of reactions to this. First: we may as well wait on Godot. Vladimir and Estragon were at least, at one point, told that Godot someday would arrive. We have no such promise of an international consensus with the force of law, and it has already been some time. Second: we will either harmonize other jurisdictions to American leadership in orbital debris regulation, or be harmonized, in some sense, to them. I choose the former, and there is some reason, incidentally, to think that other jurisdictions do, too.

This is not to say that American leadership in satellite regulation need not be consultative and benevolent. It ought to and it must be. But when the Commission waits for domestic consensus as to which organ of government satellite regulation essentially belongs, or international consensus as to which sheaf of best practices ought to be adopted by which body, the space economy continues apace. Were a Kessler Syndrome event to happen, the generation to come will not thank us for our bystander paralysis. So while we must act in consultation with international partners, the operative clause is: "we must act."

Lastly: let us leave it to the market actors themselves to self-govern. Well, yes, quite so. There are any number of essential functions within the domain not just of orbital debris mitigation, but of space traffic management broadly, for which commercial actors are perfectly

capable of self-governance. I trust that, with minimal poking, commercial satellite operators will arrive at a regularized regime for the sharing of ephemeris data, for instance. Governments can serve as a platform for sharing, and may even set the broad contours of a framework, but I expect that operators would manage the details. Similarly, I expect that operators will work to protect one another in lowering and raising stations through each other's orbits.

But even though satellite operators within low-earth orbit are unavoidably connected by considerations that arise from the very fast transit of physical objects that they own through shared physical space, incentives will not always align. And, at any rate, even if you are a good Coasean and believe that private firms negotiate around rules—well, first you do need some rules. And, other than the spasmodic reflex that overregulation "stifles innovation," I don't hear much from the commercial space sector, other than a heckler's veto here and there, that the Commission should satisfy itself to do nothing. Indeed, those same voices rose in protest of the recent evolution of the post-mission-disposal timeline—an evolution for which there was nearly universal consensus. The Commission cannot permit itself to be cajoled or wheedled into stasis by perennial malcontents when the moment calls urgently for action.

The telecom sector is in the midst of evolution and revolution, and the Commission must evolve along with it. In the regulation of satellites, the Commission has a uniquely free hand, and a unique opportunity to influence the space economy for decades to come. Whether we evolve our regulatory model or birth a new one, we must accommodate the material changes to the space sector before the anomalies begin to accrete. Only by bold action can the Commission, enabled by Congress, empower the space economy to deliver on the promise of all it can be. I look forward very much, as I always do, to being educated by the real experts in this domain, who join us here today.